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09/842,476

04/25/2001

Yuchun Wang

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 08/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/842,476

Applicant(s)

WANG ET AL.

Examiner

Lynette T. Umez-Eronini

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9 is/are allowed.
- 6) ☒ Claim(s) 1-8, 11-16 and 27-32 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☒ Claim(s) 17-26 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 and 3. 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election of claims 1-16 and 27-32 in Paper No. 5 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 3, 4, 8, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Gray et al. (US 6,008,405).

Gray teaches, "To an aqueous solution (100 g) containing 34.3% peracetic acid (CH_3COOOH , which is same as applicant's first moiety comprising a peroxide group selected from the group comprising peroxy-carboxylic acid and second moiety comprising an alkyl (same as CH_3 in the peracetic acid molecule) group and 0.9% of hydrogen peroxide, was added the following: Solution A: Sodium stannate . . . Solution B: Potassium stannate . . ." (column 9, lines 58-65). The above reads on,

a) a reagent comprising:

Art Unit: 1765

- (i) a first moiety for oxidizing the metal; and
- (ii) a second moiety for minimizing overetching the metal; and
- (b) a stannate salt for stabilizing the composition, **in claim 1**;

the first moiety comprises a peroxide group selected from the group of a peroxycarboxylic acid group, a peroxycarboxylate group, and combinations thereof, in **claim 3**; and

wherein the second moiety comprises an alkyl group, an alkyl group derivative, an aryl group, an aryl group derivative, or combinations thereof, **in claim 4**; and

wherein the stannate salt is selected from the group of sodium stannate, potassium stannate, ammonium stannate, and combinations thereof, **in claim 8**. Since Gray's composition contains the same chemicals at those of the claimed invention, then using Gray's composition in the same manner as the claimed invention would inherently result:

in a composition for chemical mechanical polishing a metal, as **in claim 1**;

wherein the first moiety is reduced to a complexing agent for the metal or oxidized metal, **in claim 2**; and

wherein the peroxycarboxylic acid group is selected from the group of peroxyacetic acid, peroxybenzoic acid, chlorobenzoic acid, peroxyformic acid, polyethylene glycol peroxy acid, and combinations thereof, **in claim 15**.

Art Unit: 1765

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gray (US '405) as applied to claim 1 above, and further in view of Hirabayashi et al. (US 6,046,110).

Gray differs in failing to teach the second moiety is selected from the group of polyethylene glycol, polyethylene glycol derivatives, benzene, benzene derivatives, and combinations thereof.

Hirabayashi teaches, ". . . The nonionic surfactants used in the present invention include, for example, polyethylene glycol . . ." (column 5, lines 18-22). "The polishing solution of the present invention further containing surfactants permits improving the selectivity of polishing between a copper or copper alloy film and an insulating film . . ." (column 5, lines 28-32).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Gray by using a polyethylene glycol surfactant as taught by Hirabayashi for the purpose of improving the selectivity of polishing between a copper or copper alloy film and an insulating film (Hirabayashi, column 5, lines 28-32).

Art Unit: 1765

6. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray (US '405) as applied to claim 1 above, and further in view of Kaufman (US 6,126,853).

Gray differs in failing to teach the composition comprising a corrosion inhibitor, in **claim 11**; and wherein the corrosion inhibitor is selected from the group of benzotriazole, imidazole, benzimidazole, benzothiazole, mercaptobenzotriazole, 5-methyl-1-benzotriazole, and combinations thereof, in **claim 12**.

Kaufman teaches, "The CMP slurry . . . includes a film forming agent. The film forming agent . . . facilitating the formation of a passivation layer of metal oxides and dissolution inhibiting layer on the surface of the metal layer." ". . . Useful film forming agents are cyclic compounds such as imidazole, benzotriazole, benzimidazole and benzothiazole . . ." (column 6, line 10-22), which read on, a corrosion inhibitor such as those recited in claim 12.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Gray by using the Kaufman's film forming agents, which is the same as applicant's corrosion inhibitor for the purpose of instantaneous formation of passivating layers and dissolution inhibiting layers on the substrate surface (Kaufman, column 6, lines 22-26).

7. Claims 6, 7, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray as applied to claim 1 above, and further in view of Kimura (US 5,869,392).

Art Unit: 1765

Gray differs in failing to specify the reagent comprises between about 0.0005 wt % and 25 wt% of the composition, **in claim 6**; the stannate salt comprises between about 0.1 ppm and about 20 ppm of the composition, **in claim 7**; the corrosion inhibitor comprises between about 0.005 wt % and about 0.05 wt % of the composition, **in claim 13**; and abrasive particles at a concentration between about 0.1 wt% and about 30 wt % of the composition, **in claim 14**.

Kimura teaches, "In the CMP process, chemical polishing variables include the kind, pH, and composition of solvent; and mechanical polishing variables include the kind and concentration of slurry, the kind of polishing cloth, the pressure applied to abrasive, and the rotational speed of a carrier (wafer). In the CMP process used in this embodiment, a pressure applied to abrasive is set at 140 g/cm²; a rotational speed of the wafer is set at 30 rpm; and a supply amount of a slurry (polishing solution) is suitably adjusted." (column 4, lines 11-16), which provides evidence that the concentration of the slurry can be changed (adjusted), thereby further providing evidence that the slurry concentration is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Gray by using Kimura as evidence that changing the slurry concentration is a so-called result effective variable, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim Rejections - 35 USC § 102

8. Claims 27 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Gray et al. (US 6,008,405).

Gray teaches, "To an aqueous solution (100 g) containing 34.3% peracetic acid (CH_3COOOH , which is same as applicant's first moiety comprising a peroxide group selected from the group comprising peroxy-carboxylic acid and second moiety comprising an alkyl (same as CH_3 in the peracetic acid molecule) group and 0.9% of hydrogen peroxide, was added the following: Solution A: Sodium stannate . . . Solution B: Potassium stannate . . ." (column 9, lines 58-65). The above reads on,

(a) a reagent comprising:

(i) a first moiety comprising a peroxide group selected from the group of a peroxy-carboxylic acid group, a peroxy-carboxylate group, and combinations thereof; and

(ii) a second moiety comprising an alkyl group, an alkyl group derivative, an aryl group, an aryl group derivative, or combinations thereof; and

(b) a stannate salt, **in claim 27**. Since Gray's composition contains the same chemicals at those of the claimed invention, then using Gray's composition in the same manner as the claimed invention would inherently result:

in a composition for chemical mechanical polishing a metal, as **in claim 27**; and

wherein the peroxide group reduces to form a complexing agent comprising a carboxylic acid, a carboxylate, or combination thereof, **in claim 28**.

Art Unit: 1765

9. Claims 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray as applied to claim 27 above, and further in view of Kimura (US 5,869,392).

Gray differs in failing to specify the reagent comprises between about 0.0005 wt % and 25 wt% of the composition, **in claim 29** and the stannate salt comprises between about 0.1 ppm and about 20 ppm of the composition, **in claim 30**.

Kimura teaches, "In the CMP process, chemical polishing variables include the kind, pH, and composition of solvent; and mechanical polishing variables include the kind and concentration of slurry, the kind of polishing cloth, the pressure applied to abrasive, and the rotational speed of a carrier (wafer). In the CMP process used in this embodiment, a pressure applied to abrasive is set at 140 g/cm²; a rotational speed of the wafer is set at 30 rpm; and a supply amount of a slurry (polishing solution) is suitably adjusted." (column 4, lines 11-16), which provides evidence that the concentration of the slurry can be changed (adjusted), thereby further providing evidence that the slurry concentration is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Gray by using Kimura as evidence that changing the slurry concentration is a so-called result effective variable, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Art Unit: 1765

10. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gray (US '405) as applied to claim 27 above, and further in view of Kaufman (US 6,126,853).

Gray differs in failing to teach the composition comprising a base, a corrosion inhibitor, abrasive particles, or combinations thereof, in claim 31 and wherein the reagent comprises an amine-peroxy acid, in claim 32.

Kaufman teaches, "The chemical mechanical polishing slurry . . . that comprises an oxidizer, an abrasive, a film forming agent (same as applicant's corrosion inhibitor), and other optional ingredients" (column 5, lines 18-22). "The pH of the CMP slurry of this invention may be adjusted using any now acid, base, or amine. However, the use of an acid or base that contains no metal ions, such as ammonium hydroxide and amines, . . . are preferred to avoid introducing undesirable metal components into the CMP slurry of the invention" (column 8, line 65 - column 9, line 4). Kaufman further teaches, "The oxidizer used in the CMP slurry of this invention may be selected from compounds which, upon reduction, form hydroxyl radicals. Non exclusive examples of metal oxidizing compounds that, upon reduction, form hydroxyl radical include peracetic acid, urea-hydrogen peroxide (same as applicant's amine-peroxy acid), urea peroxide . . . and mixtures thereof, with hydrogen peroxide and urea hydrogen peroxide being preferred oxidizers" (column 5, lines 47-56).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Gray by using Kaufman's slurry that comprises a base, a corrosion inhibitor, abrasive particles, or

Art Unit: 1765

combinations thereof and urea-hydrogen peroxide (same as applicant's amine-peroxy acid), for the purpose of selectively polishing copper relative to an insulator (Kaufman, column 4, lines 6-9).

Allowable Subject Matter

11. Claim 9 is allowed.

12. Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Lynette T. Umez-Eronini

ltue

August 11, 2003